IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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JUL 1 8 2005
PATENT & TRADEMARK OFFICE

Attorney Docket No. 15258US05

In re Application of:

Ahmadreza Rofougaran et al.

U.S. Serial No.: 09/699,019

Filed: October 27, 2000

For: ADAPTIVE RADIO TRANSCEIVER WITH A BANDPASS FILTER

Examiner: Marceau Milord

Group Art Unit: 2682

Confirmation No.: 5832

U.S.P.S. EXPRESS MAIL MAILING LABEL NO. EV 639 811 567 US

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APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal from an Office Action Made Final mailed December 28, 2004 in which claims 1-66 were rejected. A Notice of Appeal accompanied with a Request for a One-Month Extension was received by the United States Patent and Trademark Office on April 20, 2005. This appeal brief is being filed with a Request for a One-Month Extension that extends the deadline for filing an appeal brief to July 20, 2005.

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REAL PARTY IN INTEREST

Broadcom Corporation, a corporation organized under the laws of the state of California and having a place of business at 16215 Alton Parkway, Irvine, California 92618-3616, has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as set forth in the Assignment filed with the present application and recorded on Reel 011823, Frame 0791.

RELATED APPEALS AND INTERFERENCES

There are currently no appeals pending regarding related applications.

STATUS OF THE CLAIMS

Claims 1-66 are pending in the present application. Pending claims 1-26 have been rejected under 35 U.S.C. § 103(a) and are the subject of this appeal.

STATUS OF THE AMENDMENTS

There are no amendments pending in the present application.

SUMMARY OF THE INVENTION

Some embodiments according to some aspects of the present invention may provide a notch filter that may include, for example, a first polyphase filter and a second polyphase filter. The first polyphase filter may output a plurality of phases of an input signal including, for example, a first phase and an inverted first phase. The second polyphase filter may have an input that receives the inverted first phase and an inverted input to receive the first phase.

Some embodiments according to some aspects of the present invention may provide a notch filter that may include, for example, a first polyphase filter and a second polyphase filter. The first polyphase filter may include, for example, an input and an output. The output of the polyphase filter may include, for example, a non-inverted output and an inverted output. The second polyphase filter may include, for example, an input including,

for example, a non-inverted and inverted input. The non-inverted output of the first polyphase filter may be coupled to the inverted input of the second polyphase filter. The inverted output of the first polyphase filter may be coupled to the non-inverted input of the second polyphase filter.

Some embodiments according to some aspects of the present invention may provide a notch filter that may include, for example, generating means and notching means. The generating means may generate an output signal including, for example, a plurality of phases of an input signal. The notching means may notch, for example, a particular frequency of the input signal as a function of the phases.

Some embodiments according to some aspects of the present invention may provide a circuit that may include, for example, a mixer and a polyphase filter. The mixer may have, for example, an output that may include, for example, a mixed signal output and an inverted mixed signal output. The polyphase filter may have, for example, an input including, for example, a non-inverted input and an inverted input. The non-inverted input may be coupled to the inverted mixed signal output. The inverted input may be coupled to the non-inverted mixed signal output.

Some embodiments according to some aspects of the present invention may provide a circuit that may include, for example, a first polyphase filter and a second polyphase filter. The first polyphase filter may have, for example, an output including, for example, a non-inverted output and an inverted output. The second polyphase filter may have, for example, an input including, for example, a non-inverted input and an inverted input. The non-inverted input of the second polyphase filter may be coupled to the inverted output of the first polyphase filter. The inverted input of the second polyphase filter may be coupled to the non-inverted output of the first polyphase filter.

Some embodiments according to some aspects of the present invention may provide a circuit that may include, for example, mixing means and filtering means. The mixing means may mix two signals and may output a mixed signal and an inverted mixed signal. The filtering means may notch a particular frequency of the mixed signal using a polyphase structure.

Some embodiments according to some aspects of the present invention may provide a circuit that may include, for example, first filtering means and second filtering

means. The first filtering means may notch a first frequency of a signal using a first polyphase structure. The second filtering means may notch a second frequency of the signal using a second polyphase structure. The second frequency may be different from the first frequency.

ISSUES FOR REVIEW

Whether claims 1-66 are unpatentable under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 6,236,847 B1 to Eduard F. Stikvoort ("Stikvoort") in view of U.S. Patent No. 6,020,783 to Theodore A. Coppola ("Coppola").

GROUPING OF CLAIMS

Claims 1-66 do stand or fall together.

ARGUMENT

I. CLAIMS 1-66 STAND OR FALL TOGETHER

Applicants will respectfully demonstrate that Stikvoort and Coppola were improperly combined and that a *prima facie* case of obviousness has not been presented. First, Applicants will show that the proposed modification of Stikvoort using Coppola as alleged by the Examiner must change the principle of operation of Stikvoort. Second, Applicants will show that the proposed modification of Stikvoort using Coppola as alleged by the Examiner must render Stikvoort unsatisfactory for its intended purpose. Third, Applicants will show that Stikvoort and Coppola teach away from their combination. Fourth, Applicants will demonstrate that the Examiner's alleged motivation for combining Stikvoort and Coppola is vague and flawed. Although each of the arguments is sufficient by itself, the combined arguments present a substantial basis supported by evidence from the record for reversal by the Board concerning the obviousness rejection with respect to claims 1-66.

A. The Proposed Modification Cannot Change the Principle of Operation of a Reference

M.P.E.P. § 2143.01 states that "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)."

In each of the Office Actions in the present application, the Examiner has alleged that Stikvoort teaches a notch filter. See, e.g., the Office Action Made Final mailed December 28, 2004 at page 2 ("Stilvoort (sic) discloses a notch filter (fig. 1)"). Applicants have repeated argued that Stikvoort does not disclose a notch filter in FIG. 1 of Stikvoort. Nevertheless, despite repeated requests, the Examiner has refused to retract his allegation. Applicants respectfully submit that Stikvoort does not teach a notch filter in FIG. 1 of Stikvoort. In fact, Stikvoort discloses a filter arrangement characterized by a bandpass filter function. A bandpass filter is generally the opposite of a notch filter, which is a type of bandstop filter. Applicants respectfully submit that, in general, a band<u>pass</u> filter is the opposite of a band<u>stop</u> filter (e.g., a notch filter).

For support that Stikvoort describes a bandpass filter, Applicants respectfully draw the attention of the Board to line 10 of the Abstract of Stikvoort ("[i]n this way a band-pass transfer function is obtained"); col. 1, lines 59-60 of Stikvoort ("[b]y using these measures it becomes possible to obtain a receiver with an asymmetric band pass transfer function"); col. 2, line 1 of Stikvoort ("a band pass transfer function is obtained"); and col. 4, lines 19-20 ("[c]onsequently a bandpass characteristic is obtained").

Accordingly, Stikvoort does not disclose a notch filter as incorrectly alleged by the Examiner, but instead uses a first polyphase filter 16 and a second polyphase filter 19 to obtain a receiver 2 with an asymmetric bandpass transfer function. See, e.g., col. 1, lines 29-67; col. 2, lines 1-2; and FIG. 1 of Stikvoort. The bandpass filter in Stikvoort appears to allow only the desired frequency range to pass through the two polyphase filters 16, 20 before being demodulated by the demodulator 21. Thus, for example, a communications signal at a particular frequency within the desired frequency range

would pass through the two polyphase filters 16, 20 before being demodulated by the demodulator 21.

On the other hand, Coppola discloses an RF notch filter. See, e.g., the title of Coppola ("RF Notch Filter Having Multiple Notch and Variable Notch Frequency Characteristics"). The Examiner alleges that the teachings of Coppola can be used to modify the invention of Stikvoort to produce a notch filter. However, the Examiner has failed to consider that Stikvoort *requires* a bandpass transfer function to operate as described in Stikvoort. If the bandpass filter of Stikvoort is allowed to be changed into a notch filter (recalling that a notch filter is a type of band<u>stop</u> filter), then clearly the receiver 2 of Stikvoort, which relies upon an asymmetric bandpass transfer function, would change the principle of operation of Stikvoort. By modifying the bandpass filter of a receiver 2 in Stikvoort to be a notch filter, the receiver 2 of Stikvoort would reject communication signals within the desired frequency range instead of rejecting communication signals outside the desired frequency range. Accordingly, Applicants respectfully submit that the principle of operation of Stikvoort would have to change in view of the proposed modification as alleged by the Examiner.

The Examiner has never once addressed the above issues raised by Applicants even though the prosecution history shows that Applicants have presented these arguments and supporting rebuttal evidence in numerous responses to Office Actions. Instead, the Examiner has relied on general and, often times irrelevant, boilerplate responses to any and all of the arguments presented by Applicants.

Applicants respectfully submit that, according to M.P.E.P. § 2143.01, such a change in the principle of operation of Stikvoort is prohibited. According to M.P.E.P. § 2143.01, if the proposed modification or combination (i.e., Stikvoort in view of Coppola) of the prior art would change the principle of operation of the prior art invention (i.e., the receiver 2 of Stikvoort) being modified, then the teachings of Stikvoort and Coppola are insufficient to render the claims *prima facie* obvious. Without even a *prima facie* case of obviousness, the obviousness rejection based on Stikvoort in view of Coppola cannot be maintained.

For at least the above reasons, it is respectfully requested that the Board reverse the obviousness rejection.

B. The Proposed Modification Cannot Render the Prior Art Unsatisfactory for its Intended Purpose

M.P.E.P. § 2143.01 states that "[i]f proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)".

As described above, Stikvoort describes a receiver 2 using two polyphase filters 16, 19 to produce an asymmetric bandpass filter function. Applicants respectfully submit that Stikvoort's intended purpose is to receive input signals via a receiver 2, down convert the signals using frequency converters 5, 13, and bandpass filter the signals using polyphase filters 16, 19 before demodulating the baseband signals at the demodulator 21.

On the other hand, the Examiner alleges that, by modifying the receiver 2 of Stikvoort with the teachings of Coppola, a notch filter may be produced. However, as discussed above, Stikvoort will not operate without its bandpass filter to pass through a particular frequency range in which, for example, desired communication signals may reside. The modifications to Stikvoort alleged by the Examiner effectively changes the bandpass filter of Stikvoort into a notch filter (which is the opposite of a bandpass filter). Applicants respectfully submit that, by changing the bandpass filter of Stikvoort into a notch filter as alleged by the Examiner, Stikvoort can no longer operate as a receiver 2 of communication signals. Instead of passing the desired frequency range containing the communication signals, the notch filter would simply stop (i.e., bandstop) the desired frequency range containing the relevant communications signals. Since the relevant communications signals never reach the demodulator 21, Stikvoort as modified by the Examiner would not be able to function as a receiver in a communications system -- which is its intended purpose. In addition, by modifying the bandpass filter of the receiver 2 of Stikvoort by the teachings of Coppola into a notch filter as alleged by the Examiner, the modified receiver 2 of Stikvoort would pass the undesirable frequency ranges containing irrelevant communication signals and noise. Thus, the signal processing portion of Stikvoort would be flooded with noise and undesired signals.

Stikvoort as modified by Coppola as alleged by the Examiner would not be able to function as a receiver in a communication system -- which is its intended purpose.

Again, the Examiner has never once addressed the above issues raised by Applicants even though the prosecution history shows that Applicants have presented these arguments and supporting rebuttal evidence in numerous responses to Office Actions. Instead, the Examiner has relied on general and, often times irrelevant, boilerplate responses to any and all of the arguments presented by Applicants.

Applicants respectfully submit that, according to M.P.E.P. § 2143.01, modifying Stikvoort thereby rendering Stikvoort unsatisfactory for its intended purpose is prohibited. Furthermore, according to M.P.E.P. § 2143.01, if the proposed modification (i.e., Stikvoort in view of Coppola) would render the prior art invention (i.e., the receiver 2 of Stikvoort) being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification as alleged by the Examiner. Without a suggestion or motivation to make the proposed modifications, the obviousness rejection based on Stikvoort in view of Coppola cannot be maintained.

For at least the above reasons, it is respectfully requested that the Board reverse the obviousness rejection.

C. References Cannot Be Combined Where Reference Teaches Away from Their Combination

M.P.E.P. § 2145(X)(D)(2) states that "[i]t is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983)".

1. <u>Bandstop Teaches Away from Bandpass</u>

Applicants respectfully submit that, since Stikvoort teaches an asymmetric bandpass filter function and Coppola teaches an RF notch filter, Stikvoort and Coppola teach away from their combination. In other words, if Stikvoort teaches a band<u>pass</u> filter, then Coppola teaches away by teaching a band<u>stop</u> filter (e.g., a notch filter).

2. <u>RF Filter Teaches Away from Polyphase Filter</u>

Coppola teaches using an RF filter (i.e., an RF notch filter). On the other hand, Stikvoort teaches using polyphase filters. "Polyphase filters can make use of multiple

phase shifted input signals (to be provided by the frequency conversion means) to produce asymmetric transfer functions enabling suppression of signals at the image frequency **without requiring an RF filter**." Col. 1, lines 35-40 of Stikvoort (emphasis added). So according to Stikvoort, polyphase filters are used *instead* of RF filters to produce asymmetric bandpass transfer functions which are more effective at filtering image signals than RF filters. RF filters are further disparaged in the prior art section of Stikvoort as being "quite expensive". Col. 1, lines 31-31 of Stikvoort. In view of these disadvantages of RF filters as described in Stikvoort, Stikvoort states that "[t]he object of the present invention is to provide a receiver in which beside the image rejection also the adjacent channel selectivity is realized in a very cost effective way." Col. 1, lines 45-47 of Stikvoort. Thus, the very object of the invention of Stikvoort teaches away from using the RF filters of Coppola.

3. Series Teaches Away from Parallel

Coppola teaches away from passing a signal through a series of filters. In disparaging a prior art arrangement, Coppola states that "an incoming spectra passes through each of these notch filters with each notch filter attenuating its corresponding frequency spectrum. However, the desired signals in the spectra also degrade as they pass through the successive notch filters". Col. 1, lines 25-30 of Coppola. Coppola's solution is to place the notch filters in parallel. See, e.g., parallel notch filter paths 14, 20, 24 of FIG. 1 of Coppola. On the other hand, Stikvoort teaches away from Coppola by making the signal pass through a series of polyphase filters 16, 19. According to the teachings of Coppola, the signal in Stikvoort is degraded as it passes through successive polyphase filters. Thus, Stikvoort teaches away from the very improvement trumpeted by Coppola.

4. Conclusion

Again, the Examiner has never once addressed the above issues raised by Applicants even though the prosecution history shows that Applicants have presented these arguments and supporting rebuttal evidence in numerous responses to Office Actions. Instead, the Examiner has relied on general and, often times irrelevant, boilerplate responses to any and all of the arguments presented by Applicants.

Applicants respectfully submit that, according to M.P.E.P. § 2145(X)(D)(2), the combination of Stikvoort and Coppola is improper since Stikvoort and Coppola teach away from each other.

Applicants respectfully submit that any one of the three teaching away arguments directly and specifically supported by the references themselves is enough to overcome the *prima facie* case of obviousness. In addition, Applicants respectfully submit that any one of the three teaching away arguments is substantial enough to demonstrate that Stikvoort was improperly combined with Coppola. Moreover, Applicants respectfully submit that the three teaching away arguments taken together provide a substantial basis against combining Stikvoort and Coppola.

For at least the above reasons, it is respectfully requested that the Board reverse the obviousness rejection.

D. Motivation For Combination of References As Alleged by Examiner is Vague and Inaccurate

In support of modifying Stikvoort in view of Coppola, the Examiner alleges that "the motivation to do so [can be] found in the references themselves so that notch frequency filter that operates over a wide frequency range with optimal performance (see Coppola, col. 2, lines 39-43).

Applicants respectfully note that, although the Examiner states that motivation to modify Stikvoort in view of Coppola can be found in *both* references, the Examiner only provides a citation to Coppola in support of the combination.

The Examiner has previously stated that to modify Stikvoort using the teachings of Coppola would be "obvious to one of ordinary skill in the art at the time the invention was made to apply the technique of Coppola to the system of Stilvoort [sic] in order to provide a notch frequency filter that operates over a wide frequency range with **optimal performance**" (emphasis added). Office Action Made Final mailed December 28, 2004 at page 19.

As described above, Stikvoort describes a receiver 2 using two polyphase filters 16, 19 to produce an asymmetric bandpass filter function. The Examiner then proposes an alleged notch filter by inverting the bandpass filter frequency response as allegedly

taught by Coppola. As is well known in the art, a bandpass filter can generally allow through (e.g., pass), for example, a desired frequency range or channel while attenuating undesired frequency ranges or channels outside the desired frequency band. An inverter with a bandpass filter as allegedly taught by Coppola will presumably do just the opposite. In this case, the bandpass filter/inverter arrangement allegedly in Coppola would attenuate the desired frequency or channel while allowing through the undesired frequencies or channels. In view of such consequences, Applicants respectfully submit that the Examiner's proposed modification to the receiver 2 of Stikvoort does not provide optimal performance. In fact, the Examiner has failed to ever define optimal or performance despite requests for clarification from Applicants. These terms are vague and cannot be used as the "obvious" motivation for modifying Stikvoort in view of Coppola. Furthermore, Applicants respectfully note that, since the modification of Stikvoort in view of Coppola changes the receiver 2 of Stikvoort so that the receiver 2 no longer works for its intended purpose, the Examiner's motivation to achieve optimal performance seems to be in error.

In a response to provoke an Advisory Action, Applicants presented such arguments to the Examiner and requested clarifications from the Examiner. In the Response to provoke an Advisory Action dated February 28, 2005, Applicants asked the Examiner to answer the following:

> In view of the discussion above, does not the modification of the receiver 2 of Stikvoort in view of the bandpass filter/inverter arrangement allegedly in Coppola decrease desired signal and increase undesired noise? Does decreasing desired signal and increasing undesired noise constitute **optimal performance** as alleged by the Examiner?

See, e.g., Response to Provoke an Advisory Action dated February 28, 2005 at page 2. Applicants respectfully submit that modification of Stikvoort in view of Coppola which decreases desired signal and increases undesired noise does not support the Examiner's motivation of providing optimal performance.

Again, the Examiner did not address any of the issues raised by Applicants in the Response to Provoke an Advisory Action (which is hereby incorporated herein by reference in its entirety) even though the prosecution history shows that Applicants have painstakingly presented thorough arguments supported by evidence from the record. In

fact, the Examiner merely cut and paste his previous "Response to Arguments" from the Office Action Made Final at pages 19-20 onto a new sheet of paper and stapled it to the Advisory Action Summary Sheet. No further comment or analysis could be coaxed out of the Examiner despite Applicants' direct and specific request for further analysis and clarification.

Applicants respectfully submit that the motivation alleged by the Examiner for modifying Stikvoort in view of Coppola cannot be maintained. Applicants respectfully submit that optimal performance is not achieved by modifying the receiver 2 of Stikvoort with the notch filter of Coppola. Since the Examiner's motivation for modifying Stikvoort in view of Coppola has been discredited, it is respectfully submitted that the Examiner has not even presented a *prima facie* case of obviousness.

For at least the above reasons, it is respectfully requested that the Board reverse the obviousness rejection.

II. CONCLUSION

Applicants respectfully submit that any one of the arguments supported by evidence from the record as set forth above in sections A - D of part I is sufficient to overcome the obviousness rejection based on Stikvoort in view of Coppola. Applicants further respectfully submit that all of the above arguments, when taken together, provide a significant basis for the Board to reverse the obviousness rejection based on Stikvoort in view of Coppola.

For the foregoing reasons, claims 1-66 are patentable over the prior art of record. Reversal of the Examiner's rejection and issuance of a patent on the application are therefore requested.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to the deposit account of McAndrews, Held & Malloy, Account No. 13-0017.

Dated: July 18, 2005

Respectfully submitted,

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APPENDIX

The following claims are involved in this appeal:

1. A notch filter, comprising:

a first polyphase filter to output a plurality of phases of an input signal including a first phase and an inverted first phase; and

a second polyphase filter having an input to receive the inverted first phase and an inverted input to receive the first phase.

2. The notch filter of claim 1 wherein the first polyphase filter is adapted to receive the input signal, the input signal being differential, the first polyphase filter further being adapted to output a quadrature signal having an in-phase and quadrature component and an inverted quadrature signal having an inverted in-phase and inverted quadrature component, the first phase comprising one of the components of the quadrature signal and the inverted first phase comprising one of the components of the inverted quadrature signal.

3. The notch filter of claim 2 wherein the first phase comprises the quadrature component and the inverted first phase comprises the inverted quadrature component.

4. The notch filter of claim 2 wherein the first polyphase filter comprises a plurality of resistors and capacitors arranged in a polyphase structure to generate a zero at a particular frequency, the first polyphase filter outputting the quadrature signal when the input signal has a frequency at the particular frequency.

5. The notch filter of claim 4 wherein the second polyphase filter comprises a plurality of resistors and capacitors arranged in a second polyphase structure to reject the quadrature signal at the particular frequency.

6. The notch filter of claim 5 wherein the particular frequency is an odd harmonic of the input signal.

7. The notch filter of claim 6 wherein the particular frequency is a third harmonic of the input signal.

8. The notch filter of claim 1 wherein the first polyphase filter comprises first, second, third and fourth inputs adapted to receive the input signal, the input signal being differential, the first and fourth inputs being coupled together to receive a first one of the differential input signals and the second and third inputs being coupled together to receive a second one of the differential input signals.

9. The notch filter of claim 8 wherein the first polyphase filter further comprises a first resistor having a first end coupled to the first input, a first capacitor having a first end coupled to the first input, a second capacitor having a first end coupled to the second input and a second end coupled to a second end of the first resistor to form a first output, a second resistor having a first end coupled to the second input, a third capacitor having a first end coupled to the third input and a second end coupled to a second end of the second resistor to form a second output, a third resistor having a first end coupled to the third input, a fourth capacitor having a first end coupled to the fourth input and a second end coupled to a second end of the third resistor to form a third output, and a fourth resistor having a first end coupled to the fourth input and a second end coupled to a second end of the first capacitor to form a fourth output.

10. The notch filter of claim 9 wherein the second output comprises the first phase and the fourth output comprises the inverted first phase.

11. The notch filter of claim 10 wherein the second polyphase filter comprises fifth, sixth, seventh and eighth inputs, a fifth resistor having a first end coupled to the fifth input, a fifth capacitor having a first end coupled to the fifth input, a sixth capacitor having a first end coupled to the sixth input and a second end coupled to a second end of the fifth resistor, a sixth resistor having a first end coupled to the sixth input, a seventh capacitor having a first end coupled to the seventh input and a second end coupled to a second end of

the sixth resistor, a seventh resistor having a first end coupled to the seventh input, a eighth capacitor having a first end coupled to the eighth input and a second end coupled to a second end of the seventh resistor to form a seventh output, and a eighth resistor having a first end coupled to the eighth input and a second end coupled to a second end of the first capacitor to form a eighth output, and wherein the second output of the first polyphase filter is coupled to the eighth input of the second polyphase filter and the fourth output of the first polyphase filter is coupled to the sixth input of the second polyphase filter.

12. A notch filter, comprising:

a first polyphase filter including an input, and an output having a non-inverted output and an inverted output; and

a second polyphase filter having an input comprising a non-inverted and inverted input, the non-inverted output of the first polyphase filter being coupled to the inverted input of the second polyphase filter and the inverted output of the first polyphase filter being coupled to the non-inverted input of the second polyphase filter.

13. The notch filter of claim 12 wherein the input to the first polyphase filter comprises a differential input.

14. The notch filter of claim 13 wherein the input to the first polyphase filter comprises an in-phase input, an inverted in-phase input, a quadrature input and an inverted quadrature input, the in-phase input being coupled to the inverted quadrature input to receive a first one of differential signals, and the quadrature input being coupled to the inverted in-phase input to receive a second one of the differential signals.

15. The notch filter of claim 12 wherein the first polyphase filter comprises an in-phase output, a quadrature output, an inverted in-phase output and an inverted quadrature output, the non-inverted output of the first polyphase filter comprising one of the in-phase and quadrature outputs, and the inverted output of the first polyphase filter comprising one of the inverted in-phase or inverted quadrature outputs.

16. The notch filter of claim 15 wherein the non-inverted output of the first polyphase filter comprises the quadrature output and the inverted output of the first polyphase filter comprises the inverted quadrature output.

17. The notch filter of claim 12 wherein the input to the first polyphase filter comprises first, second, third and fourth inputs, the first and fourth inputs being coupled together to receive the first one of the differential signals and the second and third inputs being coupled together to receive the second one of the differential input signals.

18. The notch filter of claim 17 wherein the output of the first polyphase filter comprises first, second, third and fourth outputs, the first polyphase filter further comprising a first resistor having a first end coupled to the first input, a first capacitor having a first end coupled to the first input, a second capacitor having a first end coupled to the second input and a second end coupled to a second end of the first resistor to form the first output, a second resistor having a first end coupled to the second input, a third capacitor having a first end coupled to the third input and a second end coupled to a second end of the second resistor to form the second output, a third resistor having a first end coupled to the third input, a fourth capacitor having a first end coupled to the fourth input and a second end coupled to a second end of the third resistor to form the third output, and a fourth resistor having a first end coupled to the fourth input and a second end coupled to a second end of the first capacitor to form the fourth output, the non-inverted output of the first polyphase filter comprising the second output and the inverted output of the first polyphase circuit comprising the fourth output.

19. The notch filter of claim 18 wherein the input of the second polyphase filter comprises fifth, sixth, seventh and eighth inputs, the second polyphase filter further comprising a fifth resistor having a first end coupled to the fifth input, a fifth capacitor having a first end coupled to the fifth input, a sixth capacitor having a first end coupled to the sixth input and a second end coupled to a second end of the fifth resistor, a sixth resistor having a first end coupled to the sixth input, a seventh capacitor having a first end coupled to the seventh input and a second end coupled to a second end of the sixth resistor, a

seventh resistor having a first end coupled to the seventh input, a eighth capacitor having a first end coupled to the eighth input and a second end coupled to a second end of the seventh resistor to form a seventh output, and a eighth resistor having a first end coupled to the eighth input and a second end coupled to a second end of the first capacitor to form a eighth output, the sixth input comprising the non-inverted input to the second polyphase filter and the eighth input comprising the inverted input to the second polyphase circuit.

20. A notch filter, comprising:

generating means for generating an output signal comprising a plurality of phases of an input signal; and

notching means for notching a particular frequency of the input signal as a function of the phases.

21. The notch filter of claim 20 wherein the input signal comprises a differential signal.

22. The notch filter of claim 20 wherein the generating means further comprises means for generating the output signal with quadrature outputs when the input signal includes the particular frequency.

23. The notch filter of claim 22 wherein the notching means comprising means for rejecting the quadrature signal at the particular frequency.

24. The notch filter of claim 23 wherein the particular frequency is an odd harmonic of the input signal.

25. The notch filter of claim 24 wherein the particular frequency is a third harmonic of the input signal.

26. A method of notching a particular frequency of a signal, comprising:

generating an output signal comprising a plurality of phases of an input signal;

and

notching the particular frequency of the input signal as a function of the phases.

27. The method of claim 26 wherein the generation of the output signal comprises generating the output signal with quadrature outputs when the input signal includes the particular frequency.

28. The method of claim 27 wherein the notching of the particular frequency comprises rejecting the quadrature signal at the particular frequency.

29. The method of claim 28 wherein the particular frequency is an odd harmonic of the input signal.

30. The method of claim 29 wherein the particular frequency is a third harmonic of the input signal.

31. A circuit, comprising:

a mixer having an output including a mixed signal output and an inverted mixed signal output; and

a polyphase filter having an input including a non-inverted input coupled to the inverted mixed signal output, and an inverted input coupled to the non-inverted mixed signal output.

32. The circuit of claim 31 wherein the mixer output comprises an in-phase component, an inverted in-phase component, a quadrature component and an inverted quadrature component, the mixed signal output comprising one of the in-phase and quadrature components, and the inverted mixed signal output comprising one of the inverted in-phase and inverted quadrature components.

33. The circuit of claim 32 wherein the mixed signal output comprises the quadrature component and the inverted mixed signal output comprises the inverted

quadrature component.

34. The circuit of claim 31 wherein the polyphase filter comprises an output having a notch at a particular frequency.

35. The circuit of claim 34 wherein the polyphase filter comprises a plurality of resistors and capacitors arranged in a polyphase structure to generate a zero at the particular frequency

36. The circuit of claim 31 wherein the input of the polyphase filter comprises first, second, third and fourth inputs, the polyphase filter further comprising a first resistor having a first end coupled to the first input, a first capacitor having a first end coupled to the first input, a second capacitor having a first end coupled to the second input and a second end coupled to a second end of the first resistor to form a first output, a second resistor having a first end coupled to the second input, a third capacitor having a first end coupled to the third input and a second end coupled to a second end of the second resistor to form a second output, a third resistor having a first end coupled to the third input, a fourth capacitor having a first end coupled to the fourth input and a second end coupled to a second end of the third resistor to form a third output, and a fourth resistor having a first end coupled to the fourth input and a second end coupled to a second end of the first capacitor to form a fourth output, the second input comprising the non-inverted input and the fourth input comprising the inverted input.

37. The circuit of claim 31 further comprising a second polyphase filter having an input comprising a non-inverted and inverted input, the polyphase filter having an output comprising a non-inverted output coupled to the inverted input of the second polyphase filter and an inverted output coupled to the non-inverted input of the second polyphase filter.

38. The circuit of claim 37 wherein the mixer output comprises an in-phase component, an inverted in-phase component, a quadrature component and an inverted quadrature component, the mixed signal output comprising one of the in-phase and

quadrature components, and the inverted mixed signal output comprising one of the inverted in-phase and inverted quadrature components.

39. The circuit of claim 38 wherein the polyphase output comprises an in-phase component, an inverted in-phase component, a quadrature component and an inverted quadrature component, the non-inverted output of the polyphase filter comprising one of the in-phase and quadrature components, and the inverted output of the polyphase filter comprising one of the inverted in-phase and inverted quadrature components.

40. The circuit of claim 39 wherein the mixed signal output comprises the quadrature component of the mixer, the inverted mixed signal output comprises the inverted quadrature component of the mixer, the non-inverted output of the polyphase filter comprises the quadrature component of the polyphase filter, and the inverted output of the polyphase filter comprises the inverted quadrature component of the polyphase filter.

41. The circuit of claim 37 wherein the polyphase filter comprises a plurality of resistors and capacitors arranged in a polyphase structure to generate a zero at a first frequency, and the second polyphase filter comprises a plurality of second resistor and capacitors arranged in a second polyphase structure to generate a zero at a second frequency different from the first frequency.

42. The circuit of claim 41 wherein the output of the polyphase filter comprises a notch at the first frequency, and the second polyphase filter comprises an output having a first notch at the first frequency and a second notch at the second frequency.

43. The circuit of claim 42 further comprising a third filter having an input coupled to the output of the second polyphase filter, the third filter attenuating frequencies above a third frequency higher than the first and second frequencies.

44. The circuit of claim 37 wherein the input of the polyphase filter comprises first, second, third and fourth inputs, the polyphase filter further comprising a first resistor

having a first end coupled to the first input, a first capacitor having a first end coupled to the first input, a second capacitor having a first end coupled to the second input and a second end coupled to a second end of the first resistor to form a first output, a second resistor having a first end coupled to the second input, a third capacitor having a first end coupled to the third input and a second end coupled to a second end of the second resistor to form a second output, a third resistor having a first end coupled to the third input, a fourth capacitor having a first end coupled to the fourth input and a second end coupled to a second end of the third resistor to form a third output, and a fourth resistor having a first end coupled to the fourth input and a second end coupled to a second end of the first capacitor to form a fourth output, the second input comprising the non-inverted input and the fourth input comprising the inverted input.

45. The circuit of claim 44 wherein the input of the second polyphase filter comprises fifth, sixth, seventh and eighth inputs, the second polyphase filter further comprising a fifth resistor having a first end coupled to the fifth input, a fifth capacitor having a first end coupled to the fifth input, a sixth capacitor having a first end coupled to the sixth input and a second end coupled to a second end of the fifth resistor, a sixth resistor having a first end coupled to the sixth input, a seventh capacitor having a first end coupled to the seventh input and a second end coupled to a second end of the sixth resistor, a seventh resistor having a first end coupled to the seventh input, a eighth capacitor having a first end coupled to the eighth input and a second end coupled to a second end of the seventh resistor to form a seventh output, and a eighth resistor having a first end coupled to the eighth input and a second end coupled to a second end of the first capacitor to form a eighth output, the sixth input comprising the non-inverted input to the second polyphase filter and the eighth input comprising the inverted input to the second polyphase circuit.

46. A circuit, comprising:

a first polyphase filter having an output including a non-inverted output and an inverted output; and

a second polyphase filter having an input including a non-inverted input coupled to the inverted output of the first polyphase filter and an inverted input coupled to the

non-inverted output of the first polyphase filter.

47. The circuit of claim 46 wherein the output of the first polyphase filter comprises an in-phase component, an inverted in-phase component, a quadrature component and an inverted quadrature component, the non-inverted output of the first polyphase filter comprising one of the in-phase and quadrature components, and the inverted output of the first polyphase filter comprising one of the inverted in-phase and inverted quadrature components.

48. The circuit of claim 47 wherein the non-inverted output of the first polyphase filter comprises the quadrature component of the first polyphase filter, and the inverted output of the first polyphase device comprises the inverted quadrature component of the first polyphase filter.

49. The circuit of claim 46 wherein the first polyphase filter comprises a plurality of first resistors and capacitors arranged in a polyphase structure to generate a zero at a first frequency, and the second polyphase filter comprises a plurality of second resistor and capacitors arranged in a second polyphase structure to generate a zero at a second frequency different from the first frequency.

50. The circuit of claim 49 wherein the output of the first polyphase filter comprises a notch at the first frequency, and the second polyphase filter comprises an output having a first notch at the first frequency and a second notch at the second frequency.

51. The circuit of claim 50 further comprising a third filter having an input coupled to the output of the second polyphase filter, the third filter attenuating frequencies above a third frequency, the third frequency being higher than the first and second frequencies.

52. The circuit of claim 46 wherein the input of the first polyphase filter

comprises first, second, third and fourth inputs, the first polyphase filter further comprising a first resistor having a first end coupled to the first input, a first capacitor having a first end coupled to the first input, a second capacitor having a first end coupled to the second input and a second end coupled to a second end of the first resistor to form a first output, a second resistor having a first end coupled to the second input, a third capacitor having a first end coupled to the third input and a second end coupled to a second end of the second resistor to form a second output, a third resistor having a first end coupled to the third input, a fourth capacitor having a first end coupled to the fourth input and a second end coupled to a second end of the third resistor to form a third output, and a fourth resistor having a first end coupled to the fourth input and a second end coupled to a second end of the first capacitor to form a fourth output, the second input comprising the non-inverted input and the fourth input comprising the inverted input.

53. The circuit of claim 52 wherein the input of the second polyphase filter comprises fifth, sixth, seventh and eighth inputs, the second polyphase filter further comprising a fifth resistor having a first end coupled to the fifth input, a fifth capacitor having a first end coupled to the fifth input, a sixth capacitor having a first end coupled to the sixth input and a second end coupled to a second end of the fifth resistor, a sixth resistor having a first end coupled to the sixth input, a seventh capacitor having a first end coupled to the seventh input and a second end coupled to a second end of the sixth resistor, a seventh resistor having a first end coupled to the seventh input, a eighth capacitor having a first end coupled to the eighth input and a second end coupled to a second end of the seventh resistor to form a seventh output, and a eighth resistor having a first end coupled to the eighth input and a second end coupled to a second end of the first capacitor to form a eighth output, the sixth input comprising the non-inverted input to the second polyphase filter and the eighth input comprising the inverted input to the second polyphase filter.

54. A circuit, comprising:

mixing means for mixing two signals and outputting a mixed signal and an inverted mixed signal; and

filtering means for notching a particular frequency of the mixed signal using a

polyphase structure.

55. The circuit of claim 54 wherein the polyphase structure comprises means for generating a zero at the particular frequency

56. The circuit of claim 54 further comprising a second filtering means for notching a second frequency of the mixed signal using a second polyphase structure, the second frequency being different from the first frequency.

57. The circuit of claim 56 wherein the polyphase structure comprises means for generating a zero at the particular frequency, and the second polyphase structure comprises means for generating a second zero at the second frequency.

58. The circuit of claim 57 further comprising a third filtering means for attenuating frequencies above a third frequency of the mixed signal, the third frequency being higher than the particular and second frequencies.

59. A circuit, comprising:

first filtering means for notching a first frequency of a signal using a first polyphase structure; and

second filtering means for notching a second frequency of the signal using a second polyphase structure, the second frequency being different from the first frequency.

60. The circuit of claim 59 wherein the first polyphase structure comprises means for generating a first zero at the first frequency, and the second polyphase structure comprises means for generating a second zero at the second frequency.

61. The circuit of claim 59 further comprising a third filtering means for attenuating frequencies above a third frequency of the signal, the third frequency being higher than the second frequency.

62. A method of filtering a signal comprising notching a particular frequency of the signal using a polyphase structure.

63. The method of claim 62 wherein the notching of the particular frequency comprises generating a zero at the particular frequency using the polyphase structure.

64. The method of claim 62 further comprising notching a second frequency of the signal using a second polyphase structure, the second frequency being different from the first frequency.

65. The method of claim 64 wherein the notching of the particular frequency comprises generating a zero at the particular frequency using the polyphase structure, and the notching of the second frequency comprises generating a second zero at the second frequency using the second polyphase structure.

66. The method of claim 64 further comprising attenuating frequencies above a third frequency of the mixed signal, the third frequency being higher than the particular and second frequencies.